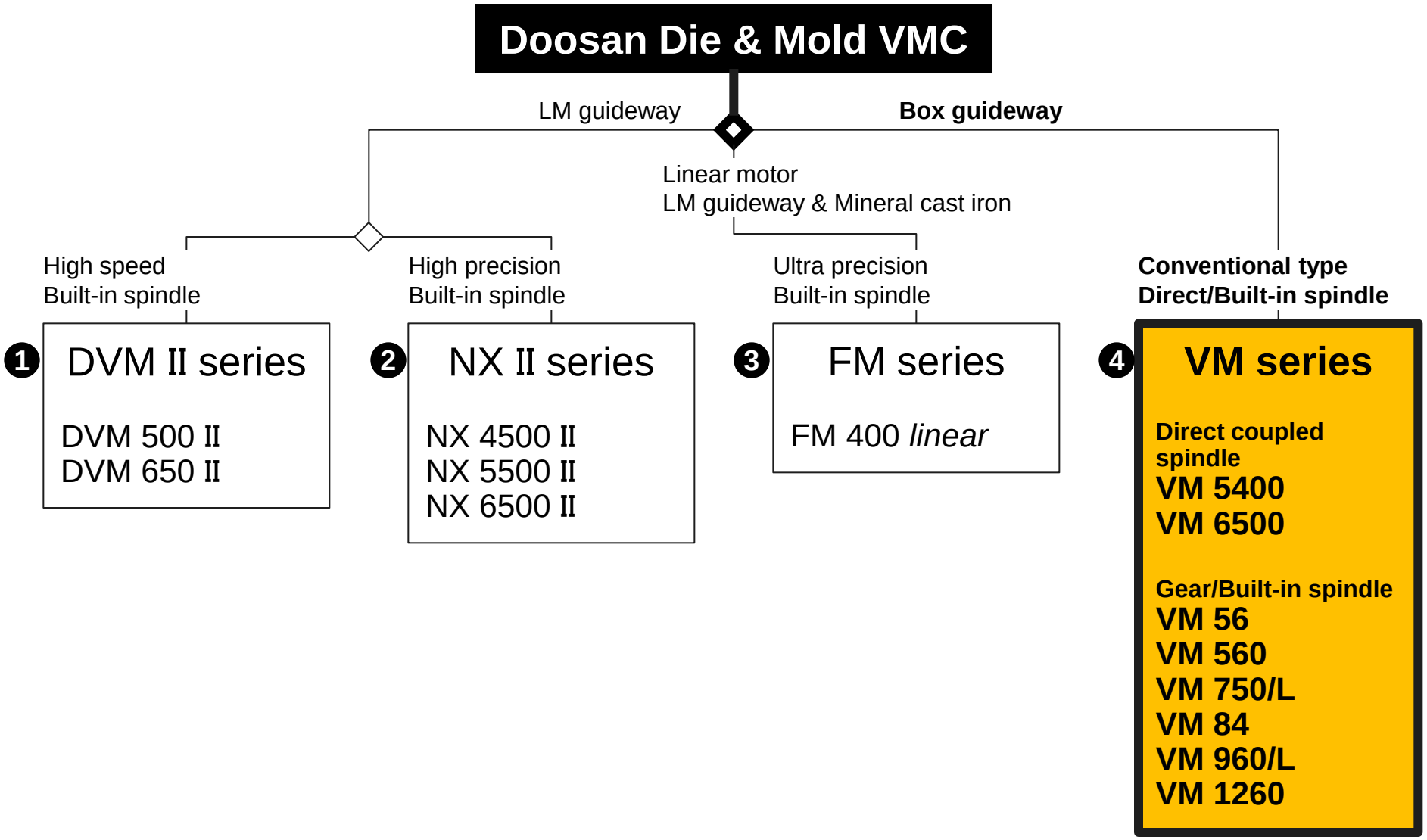
B-1. Vertical MC

		a	b		c	d				e			
Y travel or Rotary table dia. (mm)		Tapping Center	VMC		Productivity VMC	Die & Mold VMC				5axis VMC			
		DT series	DNM series	Mynx series	VC series	VM series	DVM series	NX series	FM *linear* series	DNM series	NX series	VC	FM *linear* series
													
Y travel (mm)	~ 450	DT 400 DT 360D	DNM 400 II		VC 430			NX 4500 II	FM 400 *linear*				
	~550		DNM 500 II	Mynx 5400	VC 510	VM 5400 VM 560	DVM 500 II	NX 5500 II					
	~670		DNM 650 II	Mynx 6500		VM 6500	DVM650 II	NX 6500 II					
	~750		DNM 750	Mynx 7500		VM 750							
	~850												
	~960		DNM 900			VM 960							
	~1260					VM 1260							
Rotary table dia. (mm)	350									DNM 350/5AX			FM 350/5AX *linear*
	500										NX 500/5AX		
	630											VC 630/5AX	

Concept…


Doosan Die & Mold VMC
LM guideway
Box guideway
Linear motor
LM guideway & Mineral cast iron
High speed
Built-in spindle
High precision
Built-in spindle
Ultra precision
Built-in spindle
Conventional type
Direct/Built-in spindle
1
DVM II series
DVM 500 II
DVM 650 II
2
NX II series
NX 4500 II
NX 5500 II
NX 6500 II
3
FM series
FM 400 linear
4
VM series
Direct coupled spindle
VM 5400
VM 6500
Gear/Built-in spindle
VM 56
VM 560
VM 750/L
VM 84
VM 960/L
VM 1260

d-4 VM series

Function →

Size ↓

Y travel (mm)	Tool taper	X travel (mm)	Die & Mold			
			Conventional	High speed	High precision	Ultra precision
450	#40	600			NX 4500 II	
540		1020	VM 5400			
		1020		DVM 500 II		
550		900			NX 5500 II	
560	#50	1050	VM 56			
			VM 560			
600	HSK 40E	400				FM 400 *linear*
650	#40	900			NX 6500 II	
670		1270	VM 6500			
		1270		DVM 650 II		
750	#50	1500	VM 750			
		1800	VM 750L			
840	#50	2000	VM 84			
960	#50	2000	VM 960			
		2400	VM 960L			
1260	#50	2500	VM 1260			

VM5400/6500 – OVER VIEW

VMC for DIE & MOLD

Die & mold oriented, High performance VMC w/ #40 taper

Main Specification

STROKE VM5400 : 1020/540/530 mm
VM6500 : 1270/670/625mm
TABLE SIZE VM5400 : 1200 x 540 mm, 800kgf
VM6500 : 1400 x 670 mm, 1000kgf
SPINDLE : 12,000 rpm, 15.6kW, BT40
RAPID TRAVERSE (X/Y/Z) : 30/30/24 m/min
TOOL STORAGE : 30T (40T, OPT.)
ATC TIME : 1.3 sec
NC : FANUC 32ib

Application

DIE & MOLD

PRECISE AUTOMOTIVE & IT COMPONENTS

Typical Work piece

LAMP REFLECTOR

FILTER HOUSING

Main Features

DIRECT SPINDLE (LOW VIBRATION, LOW NOISE)
BOX GUIDEWAY (EXCELLENT HEAVY CUTTING)
Y-STROKE EXPANSION
VM5400 : 510 ➔ 540 mm
VM6500 : 650 ➔ 670 mm
NEW DESIGN FOR INCREASING RELIABILITY AND PERFORMANCE

Competitor

MORI, HWACHEON

Status / Schedule

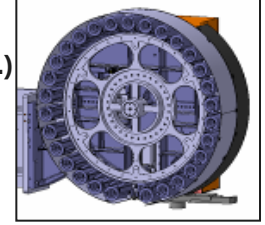
MASS PRODUCTION : OCT.2010~

1 VM5400/6500 Features

TS27R (Opt.)

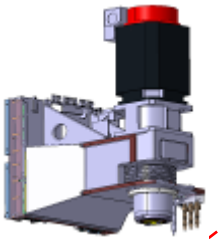
- Automatic tool measurement
- Thermal error compensation

CAM Type ATC



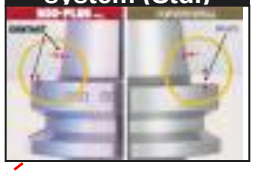
- 30tool
- 40tool (opt.)

12,000r/min (Std.)



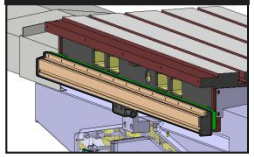
- Thermally symmerical Spindle head body structure
- Direct coupled spindle

Dual contact system (Std.)

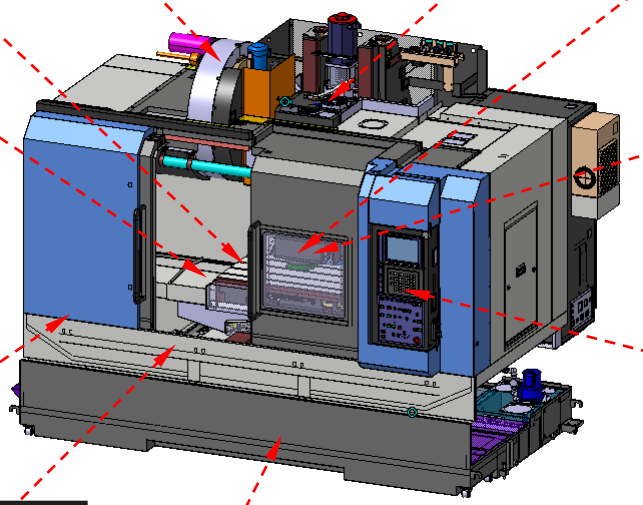


- precision machining through minimized tool vibration

Linear scale (Opt.)



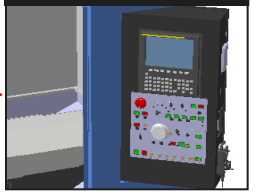
- Direct Feed Back



Air Blow (Std.)

- Easy MQL Piping
- Better working circumstance

Swivel OP BOX

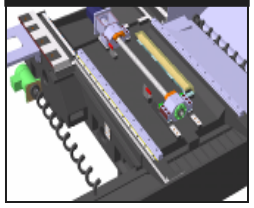


- Fanuc 32i MA
- DSQ1 (80 Blocks)

Oil Cooler

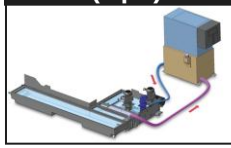
- Spindle head cooling system
- Minimize spindle head thermal displacement.

Screw Conveyor



- Internal Screw conveyor for easy chip disposal

Coolant Chiller (Opt.)

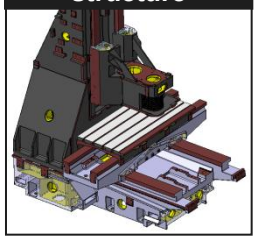


- Restrain thermal deformation by coolant temp. control.

High rigid Box Guide

- Wide & thick guideway
- Excellence in vibration absorbing

High rigid structure



- Rigid C-frame structure with ARCH-shape column

1 VM5400/6500 Specification

COMPARISON IN SPECIFICATIONS (VM 3-DIGIT Vs VM 4-DIGIT)

Specification		Unit	VM510	VM640	VM5400	VM6500
Axis	X/Y/Z Travel	mm	1020/510/625	1300/650/625	1020/540/530	1270/670/625
	X/Y/Z rapid	m/min	30/30/24	24/24/20	30/30/24	
	cutting feedrate	mm/min	12000	10000	12000	
Table	Size	mm	1200*500	1400*650	1200*540	1400*670
	Max load	kg	800	1000	800	1000
Spindle Motor	Power transmission		Direct connection		Direct connection	
	Taper		#40		#40	
	Motor model		a22		a22	
	Max speed	r/min	12000		12000	
	Power [con/30min]	kW	15.6/15.6		15.6/15.6	
	Max torque	Nm	165.62		165.62	
ATC	Tool storage	ea	24		30	
	Max tool dia.	mm	90		80	
	[Adjacent empty]	mm	150		125	
	Max tool length	mm	250		300	
	Max tool weight	kg	8		8	
	T-T-T	sec	1.5		1.3	
	C-T-C	sec	8		3.7	
Tank capacity		L	300		380	
L/W/H		mm	3340*3280*3140	3550*3280*3140	2444*3350*2744	2674*3350*2897
Weight		kg	7000	9000	7000	8800
control			F21iMB (HHiTNC530)		F32iA	
Display			8.4" Color LCD(10.4" Color LCD)		10.4" color LCD	

VM750(L)/960(L)/1260(L) Over view

Machine Concept

The middle/large Mold & Die Vertical machining Center

Main Specifications

STROKE VM1260 : 2500/1260/900 mm
VM960 : 2000/960/800 mm
VM750 : 1500/750/800 mm
Table VM1260 : 2800 x 1260 mm, 8000kgf
VM960 : 2400 x 950 mm, 4000kgf
VM750 : 1600 x 800 mm, 3000kgf
Spindle : 6,000rpm, 15kW(18.5kW), BT50 – Gear Box
: 8,000rpm, 15kW(18.5kW), BT50 – Gear Box
: 12,000 rpm, 25kW(30kW), BT50 – Built-In
Tool Storage : 30T(40T)
NC : FANUC 31iB

Applications

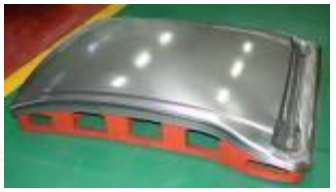
Press Mold & Die, Mold base

Industry parts

Typical Work piece

BUMPER

ROOF



Main Features

- All axis composed with wide box slide way for high rigidity Ball Screw Nut Cooling (Y axis)(VM1260 X,Y axis)
- Improve the dynamic and static stiffness by FEM analysis
- Apply two internal spiral & lift up chip conveyor to standard for rapid chip disposal
- Radial RIB structure
- Thermal error compensation

Major Competitors

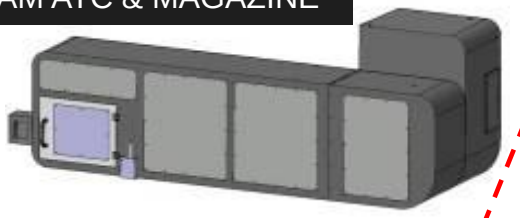
HWACHEON, WIA, OKK

1 VM750(L)/960(L)/1260(L) Sales points (1/2)

EOCR

Sensing overload and removes accumulated chips by rotating CW or CCW.
➔ Protect motor damage and smooth chip disposal

CAM ATC & MAGAZINE

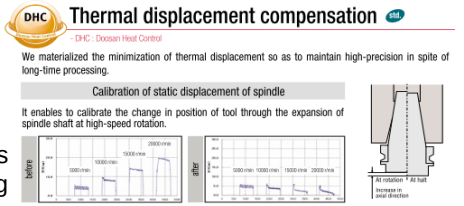


Memory RANDOM
-30 Tool(STD.)
-40 Tool(OPT. ,VM1260 STD)

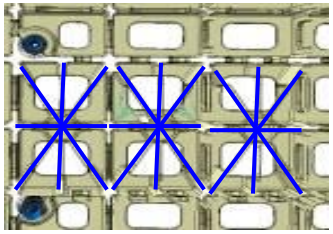
Variable spindle

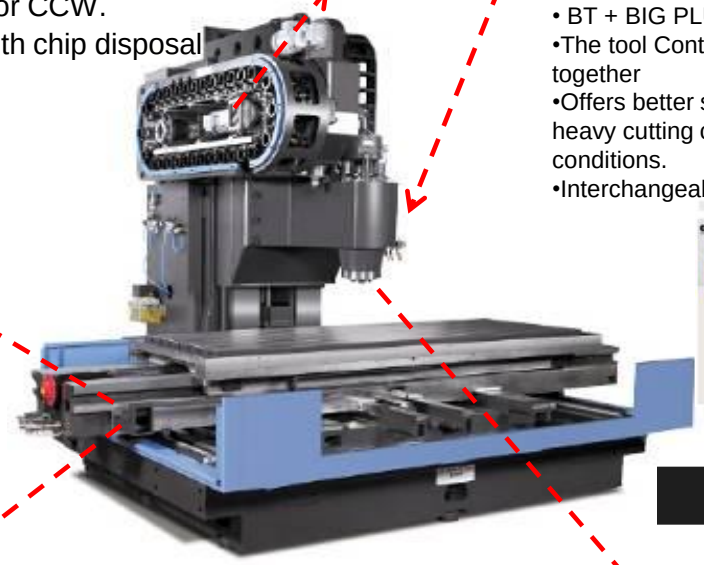
6000(8000)rpm : Gear box
12000rpm : built-in

Die & Mold solution



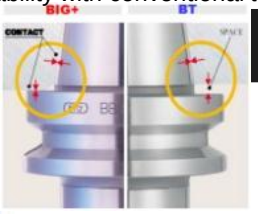
Radial RIB structure



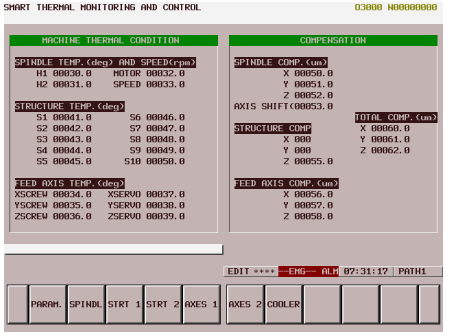


High Accuracy ➔ BBT SPINLDLE Application

- 2-FACES LOCKING TOOL SYSTEM
- BT + BIG PLUS
- The tool Contacts Spindle taper and nose together
- Offers better surface finishing and improves heavy cutting capability under severe cutting conditions.
- Interchangeability with conventional tool



Smart thermal compensator(VM750(L)/VM960(L)/1260)



Apply thermal compensator
Install column protect cover

Slide bearing

Slide bearing is boned to upper side of SADDLE
➔ Long time Accuracy Preservation
➔ Anti stick-slip structure by Oil Groove

Long Nose Spindle

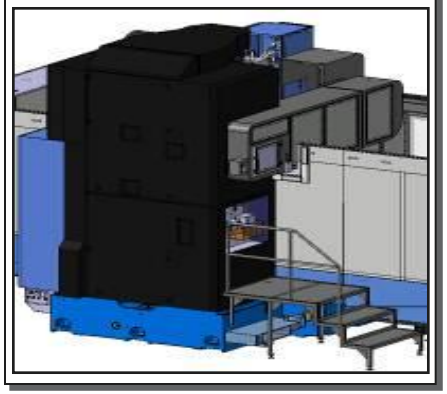
Possible DEEP POCKET
Mold & Die

VM750(L)/960(L)/1260(L) Sales points (2/2)

Improve of accuracy by Thermal error compensation

1. FRAME + SPINDLE : Apply thermal error compensator

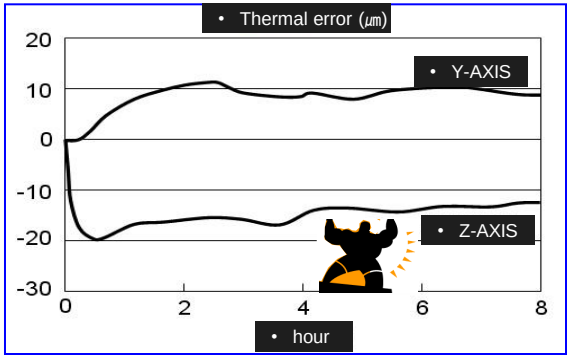
COLUMN PROTECT COVER



SPINDLE DISPLACE CONTROL

FRAME DEFORMATION CONTROL

→THERMAL ERROR COMPENSATOR



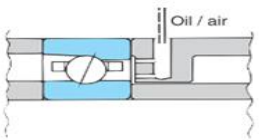
- * 12,000rpm SPINDLE
- – Installation Temperature Range : 10 ~ 30 degrees
- – Changes in temperature : Changes of the day up to 6 degrees (Less than 1.0 degrees per hour)
- – Plant height changes in temperature: Less than 0.5 degrees per 1m

2. Reduce thermal displacement

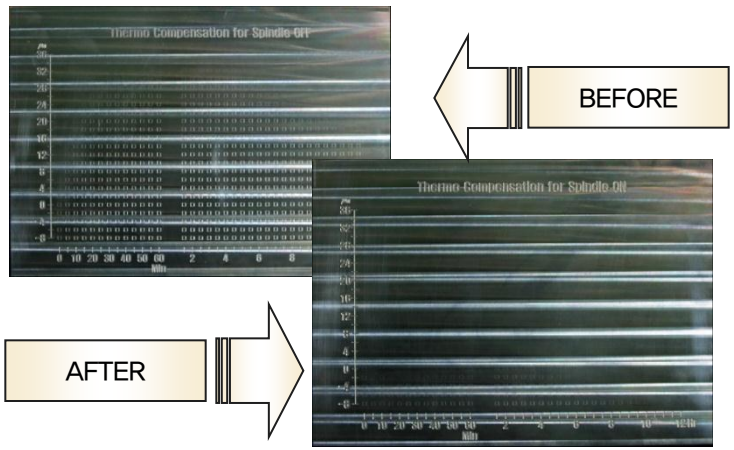
Ball screw nut cooling

Spindle AXIS SHIFT CONTROL

Oil air lubrication



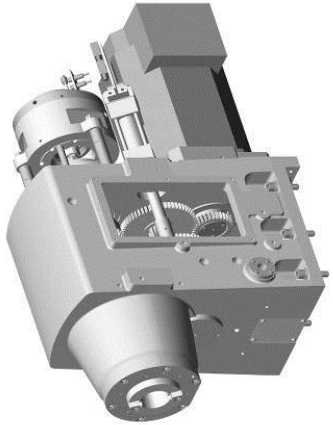
0.1 degree control oil cooler



VM750(L)/960(L)/1260(L) Specifications

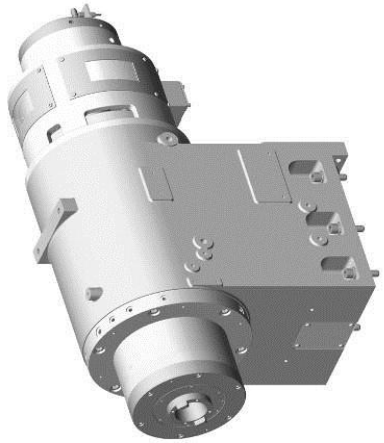
Descriptions		Unit	*VM56*	*VM560/50*	*VM750(L)*	*VM84*	*VM960(L)*	*VM1260*
Travel	X-axis	mm	1050	1050	1500/1800	2000	2000/2400	2500
	Y-axis	mm	560	560	750	840	960	1260
	Z-axis	mm	560	560	800	800	800	900
Spindle nose to table top		mm	150~710	150~710	200~1000	200~1000	200~1000	200~1100
Spindle center to column		mm	600	600	865	860	1005	1320
Rapid traverse(X/Y/Z)		m/min	12/12/12	30/30/24	20/20/20	16/16/16	16/16/16	12/12/12
Guideway type			Box	Box	Box	Box	Box	Box
Table	Size	mm	1600x560	1600x560	1600/1900x800	2200x810	2400/2600x950	2800x1260
	Allowable load	kgf	1500	1500	3000/3500	2500	4000/4500	8000
Spindle	Spindle taper		#50	#50	#50	#50	#50	#50
	Motor power	kW	15/18.5	18.5/22	15/18.5 (25/30)	15/18.5	15/18.5 (25/30)	18.5/22(25/30)
	Power transmission		Gear-Shift	Built-in	Gear-Shift (Built-in)	Gear-Shift	Gear-Shift (Built-in)	Gear-Shift (Built-in)
	Spindle speed	rpm	6K	12K	6K,8K(12K)	6K	6K,8K(12K)	6K,8K (12K)
	Spindle cooling		Std.	Std.	Std.	Std.	Std.	Std.
	Max. torque/rpm	N.m/rpm	561.54/314	204/1500	561.54/314 (420.42/600)	492.94/358	561.54/314 (420.42/600)	668.36/314 (420.42/600)
ATC	Tool changer type		Cam	Cam	Cam	Cam	Cam	Cam
	Tool storage		30	30	30(40)	30	30(40)	40
	Max. tool dia.	mm	Φ 125/230	Φ 125/230	Φ 125/230	Φ 125/230	Φ 125/230	Φ 125/230
	Max. tool weight	kgf	15	15	15	15	15	15
	Max. tool length	mm	350	350	350	350	350	350
	Tool to tool time	sec	3	3	3	3	3	3
	Chip to chip time	sec	8	6	6	7	8	8
Splash guard			Opt.	Std.	Opt.	None	Opt.	Opt.
Guard roof			Opt.	Std.	Opt.	None	Opt.	Opt.
Base coolant			None	Opt.	None	None	None	None
Pendant			Apllied	Apllied	Apllied	Apllied	Apllied	Apllied
NC unit			F-31iB	F-31iB	F-31iB	F-31iB	F-31iB	F-31iB
NC display			10.4" Color TFT LCD	10.4" Color TFT LCD	10.4" Color TFT LCD	10.4" Color TFT LCD	10.4" Color TFT LCD	10.4" Color TFT LCD
Machine weight (std. M/C)		kgf	8500	9000	14000/14800	15000	20000/21000	31000
Machine dimension (std. M/C)		mm	3700x3710x2683	3800x3990x3240	4900/5500x4927x3545	6350x4897x3450	6400/6800x5138x3545	6938x5645x3930

Low Vibration & High Accuracy Spindle Unit



Gear Box Type (STD.)

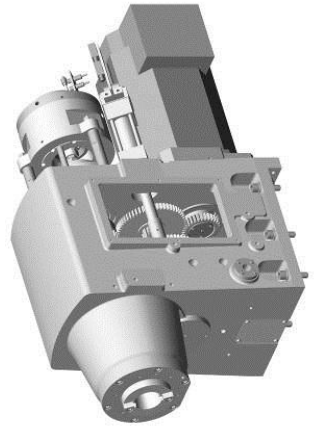
- Power cutting
- 6,000 rpm
- Power : 15/18.5 kW
- Torque : 561.54 N.m



Built-in Type (OPT.)

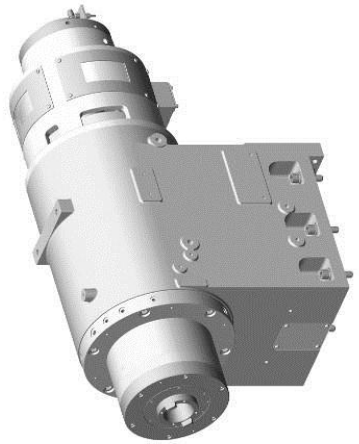
- Low vibration & High Chip Volume Cutting
- 12,000 rpm
- Power : 25 / 30 kW
- Torque : 419.4 N.m

Low Vibration & High Accuracy Spindle Unit



Gear Box Type (STD.)

- Power cutting
- 6,000 rpm
- Power : 18.5/22 kW
- Torque : 668.36 N.m



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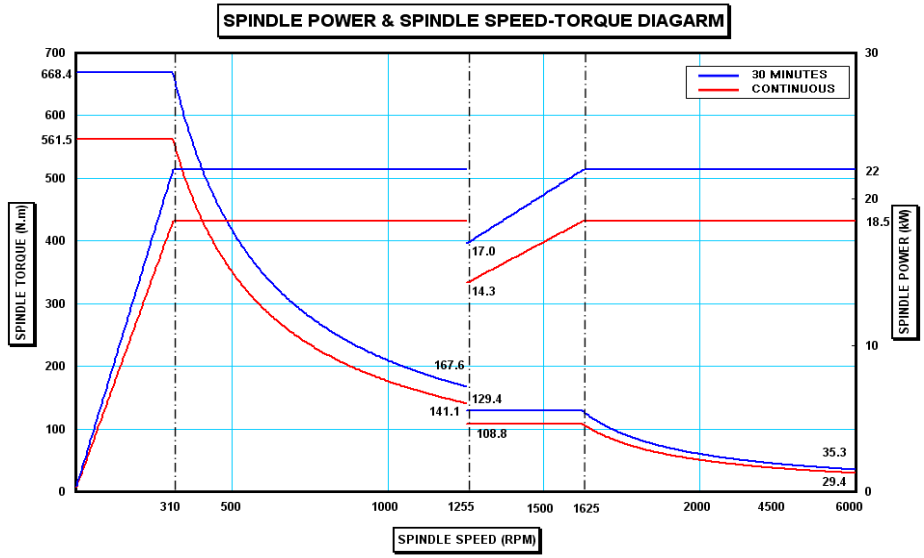
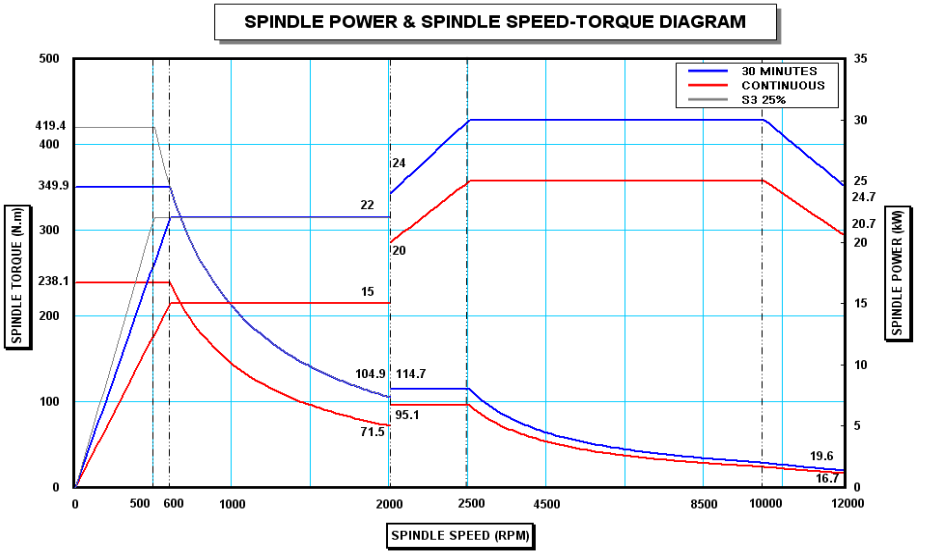
- 12,000 rpm
- Power : 25 / 30 kW
- Torque : 419.4 N.m





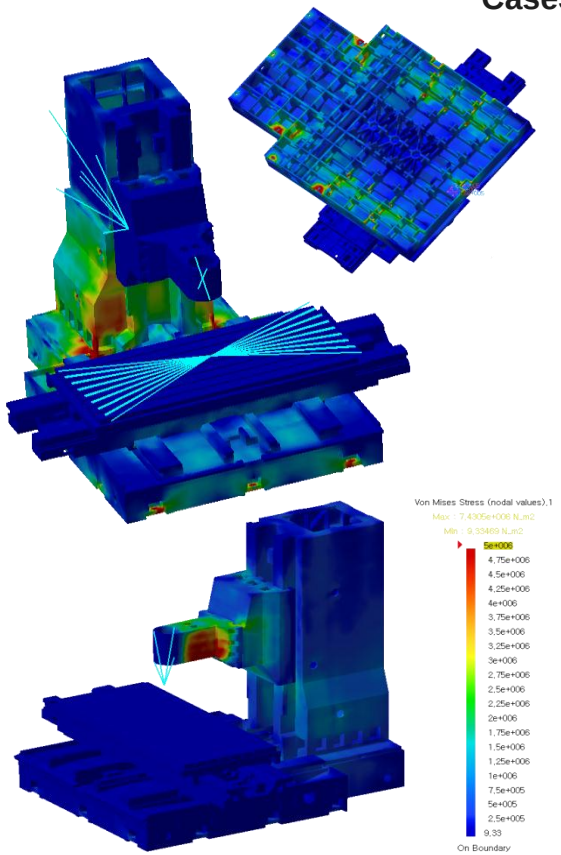
Technical Material

- **Improve the dynamic and static stiffness by FEM analysis**

  Case1) Self-weight

  Case2) Max. loading weight 8,000 kgf

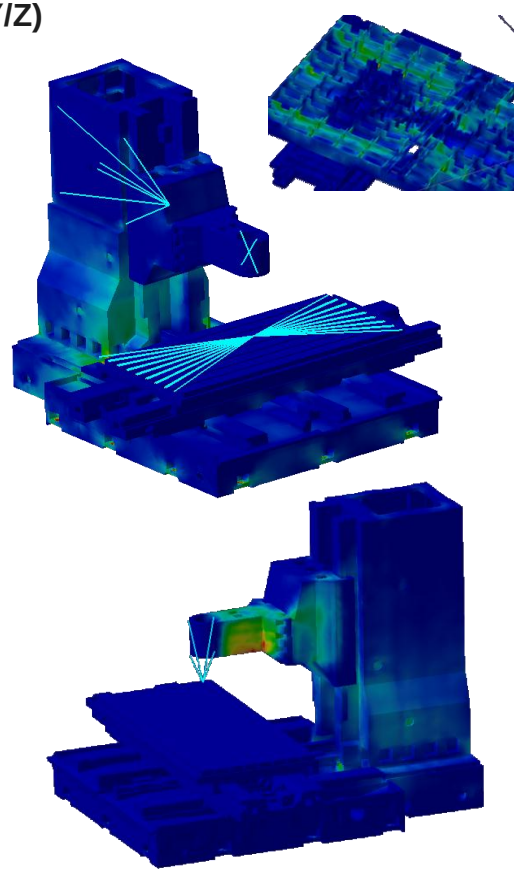
  Case3) Max. cutting force 2,000/2,000/1,800 kgf (X/Y/Z)



Redesign parts
- **Bed & Column**
- **Saddle & Table**
- **Head & Head base frame**

⇨ **Internal rib, Outer wall**

Optimal Design

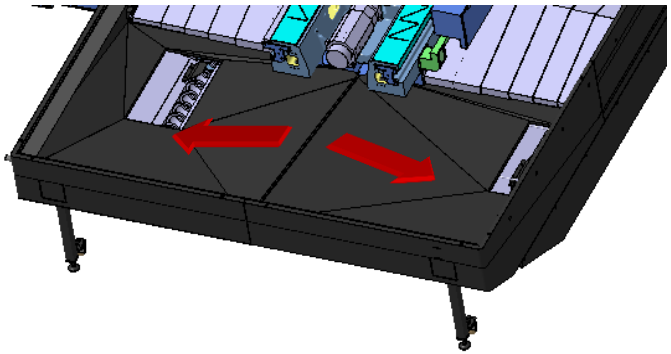


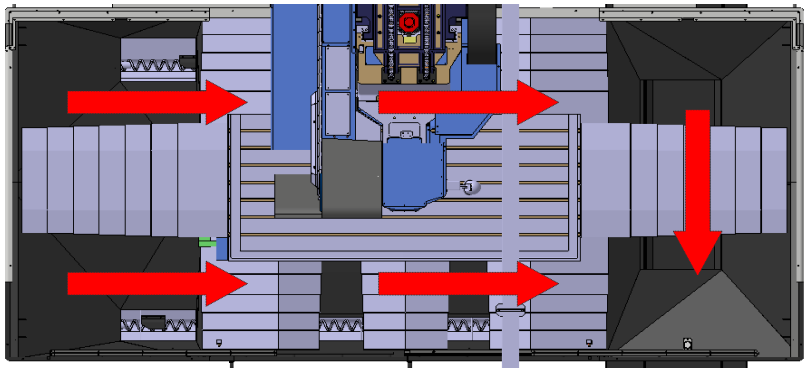
Chip Disposal System

Cutting chip disposal direction

1) Internal Chip Conveyor (Spiral Type)

- Apply two (Front, Rear) spiral type internal chip conveyor to standard
- This improve chip disposal capacity than Base coolant system of Old Model.





2) Lift up chip conveyor

- Apply lift up chip conveyor to standard for rapid chip disposal